# Math 220 Worksheet 4

**To be done in teams without books or notes.**

**Names:** _____

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1. (5 minutes, 1999 Exam 1) Consider the function $f$ with formula

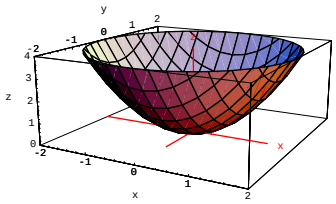
$$f(x,y) = \begin{cases} \dfrac{x^2 y}{x^2+y^2} & \text{for } (x,y) \neq (0,0) \\ 0 & \text{if } (x,y) = (0,0) \end{cases}$$

Noting that $|x^2 y| \leq |(x^2+y^2)y|$ for any $x$ and $y$, show that as $(x,y) \to (0,0)$ this function approaches $0 = f(0,0)$. What do you conclude about the continuity of $f$ at $(0,0)$?

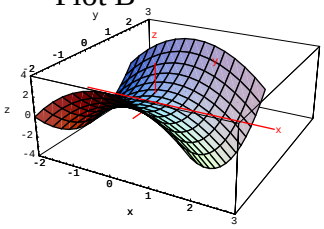
2. (a) (5 minutes, 1995 Exam 1) Consider the function $f : \mathbf{R}^2 \to \mathbf{R}$ with formula $f(x,y) = \left(x^2+y^2\right)/4$. Draw the level curves of $f$ corresponding to $z = 0, 1, 2, 4$. From those, desribe the family of all level curves of $f$.

(b) (2.5 minutes, 1996, Exam 1) Consider the function $g : \mathbf{R}^3 \to \mathbf{R}$ with formula $g(x,y,z) = x^2 - y^2 + z$. Identify (by giving their name) the level surfaces of $g$. Which of the following sketches could be that of the level surface that corresponds to $w = g(x,y,z) = 0$?

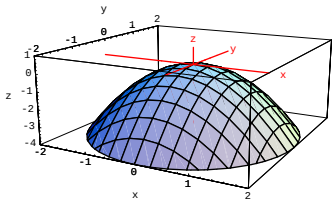
Plot A



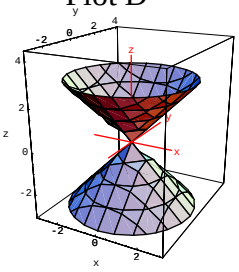
Plot B



Plot C



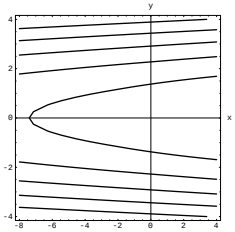
Plot D



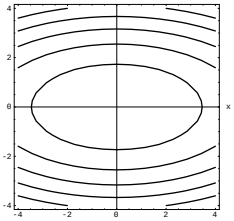
**Answer:** _____

3. (2.5 minutes, 1999 Exam 1) Which of the following sets of level curves can be those for the surface whose equation is $z = x^2 - 4y^2$? Explain!

Plot A



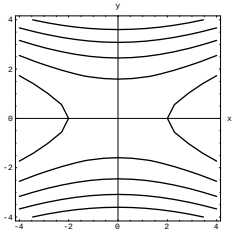
Plot B



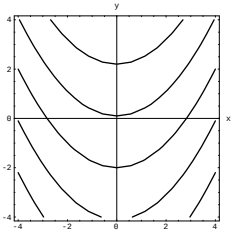
**Answer:** _____

**Reasoning:**

Plot C



Plot D



4. (2.5 minutes) What is the name of the quadric surface whose equation is $\frac{x^2}{16} - \frac{y^2}{9} + \frac{z^2}{16} = 1$?

**Answer:** _____